

What is claimed is:

- 5 1. A method for constructing an array of MEMS devices, comprising the steps of:
dicing the MEMS wafer to separate individual dies from an original fabrication
wafer;
placing the die in a holder;
bringing the die in said holder into proximity to a second wafer;
10 adjusting the orientation of the die relative to the second wafer; and
connecting said die onto said second wafer.
- 15 2. The method of claim 1, further comprising the step of:
rotating said die out of the original plane of fabrication, and connecting to said
second wafer.
- 20 3. The method of claim 1, further comprising the step of:
applying light to said die;
measuring the intensity of light scattered by said die; and
using a light intensity measurement to adjust the orientation of said die.
- 25 4. The method of claim 1, further comprising the step of:
connecting said die electrically to said second wafer.
5. The method of claim 1, further comprising the step of applying heat to a contact area
between said die and said wafer, in order to cure a bonding adhesive.

6. The method of claim 5, further comprising the step of applying a light source to a contact area between said die and said second wafer, in order to cure a bonding adhesive.
- 5 7. The method of claim 5, further comprising the step of: packaging the array in a eutectic seal.
8. The method of claim 5, in which the contact area for bonding is on both sides of the die.
- 10 9. The method of claim 8 in which the bonding areas are metals.
10. The method of claim 5, further comprising the step of: hermetically enclosing a gas within the sealed package.
- 15 11. The method of claim 10, wherein the enclosed gas is xenon.
12. The method of claim 10, wherein the enclosed gas is helium.
- 20 13. A method for constructing an array of MEMS devices, comprising the steps of: dicing the MEMS wafer to separate individual rows from an original fabrication wafer; selecting from the row, a set of contiguous devices within the row; discarding from the row the devices not selected; placing the row in a holder; bringing the row in said holder into proximity to a second wafer; adjusting the orientation of the row relative to the second wafer; and connecting said die onto said second wafer.

14. An apparatus for bringing an individual die contained in a die holder adjacent to a second wafer, said apparatus comprising:

5 an elevation actuator to adjust the elevation of said die in said holder relative to the second wafer; and
an azimuthal actuator to adjust the azimuthal orientation of said die in said die holder relative to the second wafer.

15. The apparatus of claim 14, further comprising:

10 a slab of piezoelectric material affixed to said elevation actuator and said azimuthal actuator, to impart motion to the actuators to effect the adjustment of the orientation of said die in said die holder, with respect to the second wafer.

16. The apparatus of claim 14, further comprising:

15 a light source for heating the contact points of said die and said second wafer.

17. The apparatus of claim 14, further comprising:

20 a light source impinging on a surface of said die and scattered by the die;
an optical detector which produces a signal in response to the light scattered by said die; and
logic circuitry to control said apparatus based on the signal from the optical detector.

18. An array of lithographically fabricated MEMS devices comprising:

25 a plurality of individual dies containing the individual MEMS devices, each die having been separated from adjacent dies on the original fabrication wafer, with each die of the plurality having been oriented in the correct position with respect to a second wafer, and affixed mechanically to said second wafer.

19. An array of lithographically fabricated MEMS devices according to claim 18,
wherein each individual die in the array is connected electrically to supporting
circuiting in said second wafer.

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20. An array of lithographically fabricated MEMS devices according to claim 18,
wherein said second wafer contains electronic circuitry to manipulate said
MEMS devices.

- 10 21. An array of lithographically fabricated MEMS devices according to claim 18,
wherein each individual die has been rotated out of the original plane of fabrication.

22. An array of lithographically fabricated MEMS devices according to claim 18,
wherein the dies in the array are not all alike.

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23. An array of lithographically fabricated MEMS devices according to claim 18,
wherein the MEMS device is a utilitarian feature affixed to a microactuator.

- 20 24. An array of lithographically fabricated MEMS devices according to claim 18,
wherein the MEMS device is fluid flow diverter affixed to a MEMS microactuator.

25. An array of lithographically fabricated MEMS devices according to claim 18,
wherein the MEMS device is an electrical relay affixed to a MEMS microactuator.

- 25 26. An array of lithographically fabricated MEMS devices according to claim 18,
wherein the utilitarian features differ among the plurality of individual devices.

27. An array of lithographically fabricated MEMS devices according to claim 18,
wherein all utilitarian features are the same among the plurality of utilitarian devices.
28. An array of lithographically fabricated MEMS devices according to claim 18,
5 wherein the MEMS device is an optical element affixed to a MEMS microactuator.
29. An array of lithographically fabricated MEMS devices according to claim 28,
wherein said optical element is a mirror.
- 10 30. An array of lithographically fabricated MEMS devices according to claim 29,
wherein the array is coupled with a block of N input optical fibers and a block of M
exit optical fibers, forming an integrated N x M fiber optic switch.

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